

WHAT IS CLAIMED IS:

1. A semiconductor laser device comprising:
an optical fiber having an optical fiber grating;
5 a semiconductor laser having an active layer with a
single quantum well, for emitting laser light; and
a coupling optical system for coupling the laser light
emitted out of the semiconductor laser into the optical fiber.

10 2. The semiconductor laser device according to Claim 1,
wherein the coupling optical system includes a narrow-band
filter for adjusting an incident angle of the laser light
emitted out of the semiconductor laser.

15 3. The semiconductor laser device according to Claim 1,
wherein the optical fiber grating has a reflection bandwidth
wider than or substantially equal to a 3dB bandwidth of a gain
of the semiconductor laser or a spectrum full width at half
maximum of the laser light of the semiconductor laser.

20 4. The semiconductor laser device according to Claim 1,
wherein the coupling optical system has a narrow-band filter
for adjusting an incident angle of the laser light emitted out
of the semiconductor laser, and wherein the optical fiber
25 grating has a reflection bandwidth wider than or substantially
equal to a 3dB bandwidth of a gain of the semiconductor laser
or a spectrum full width at half maximum of the laser light
of the semiconductor laser.

30 5. The semiconductor laser device according to Claim 2,

wherein the coupling optical system includes a collimator lens for collimating the laser light emitted out of the semiconductor laser and for outputting the collimated laser light to the narrow-band filter, and a condenser lens for
5 focusing the laser light output from the narrow-band filter onto the optical fiber.

6. The semiconductor laser device according to Claim 1, wherein the semiconductor laser has an anti-reflection coating
10 with a reflectivity of about 10 % or less, which is formed on an emitting exit face thereof from which the laser light is emitted.

7. The semiconductor laser device according to Claim 6,
15 wherein the anti-reflection coating has a reflectivity lower than that of the optical fiber grating.

8. The semiconductor laser device according to Claim 1, wherein the semiconductor laser includes a layer having a
20 refraction index lower than that of an optical guide layer disposed outside the active layer with the single quantum well, said layer having such a thickness as to prevent itself from becoming a barrier that keeps an electric current from flowing through the semiconductor laser and said layer being disposed
25 outside the optical guide layer.

9. The semiconductor laser device according to Claim 1, wherein the active layer, a barrier layer, and a guide layer of the semiconductor laser are configured to have a distortion
30 compensating structure.

10. The semiconductor laser device according to Claim 2, wherein the optical fiber grating has a reflection bandwidth of 5 nm or more.

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11. The semiconductor laser device according to Claim 2, wherein the narrow-band filter includes an incident angle adjusting mechanism for adjusting the narrow-band filter so that the incident angle of the laser light incident on the narrow-band filter approaches 90 degrees with increasing ambient temperature.

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12. The semiconductor laser device according to Claim 1, wherein the active layer with the single quantum well of the semiconductor laser has a thickness ranging from 10 nm to 25 nm.

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13. A semiconductor laser device comprising:
an optical fiber having an optical fiber grating;
a semiconductor laser having an active layer with two or more quantum wells formed at intervals that are close enough to provide quantum coupling, for emitting laser light; and
a coupling optical system for coupling the laser light emitted out of the semiconductor laser into the optical fiber.

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14. The semiconductor laser device according to Claim 13, wherein the coupling optical system includes a narrow-band filter for adjusting an incident angle of the laser light emitted out of the semiconductor laser.

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15. The semiconductor laser device according to Claim 13, wherein the optical fiber grating has a reflection bandwidth wider than or substantially equal to a 3dB bandwidth of a gain of the semiconductor laser or a spectrum full width at half maximum of the laser light of the semiconductor laser.

16. The semiconductor laser device according to Claim 13, wherein the coupling optical system has a narrow-band filter for adjusting an incident angle of the laser light emitted out of the semiconductor laser, and wherein the optical fiber grating has a reflection bandwidth wider than or substantially equal to a 3dB bandwidth of a gain of the semiconductor laser or a spectrum full width at half maximum of the laser light of the semiconductor laser.

17. The semiconductor laser device according to Claim 14, wherein the coupling optical system includes a collimator lens for collimating the laser light emitted out of the semiconductor laser and for outputting the collimated laser light to the narrow-band filter, and a condenser lens for focusing the laser light output from the narrow-band filter onto the optical fiber.

18. The semiconductor laser device according to Claim 13, wherein the semiconductor laser has an anti-reflection coating with a reflectivity of about 10 % or less, which is formed on an emitting exit face thereof from which the laser light is emitted.

19. The semiconductor laser device according to Claim

18, wherein the anti-reflection coating has a reflectivity lower than that of the optical fiber grating.

20. The semiconductor laser device according to Claim
5 13, wherein the active layer, a barrier layer, and a guide layer of the semiconductor laser are configured to have a distortion compensating structure.

21. The semiconductor laser device according to Claim
10 13, wherein the two or more quantum wells are formed at intervals of 8 nm or less.

22. The semiconductor laser device according to Claim
15 14, wherein the optical fiber grating has a reflection bandwidth of 5 nm or more.

23. The semiconductor laser device according to Claim
20 14, wherein the narrow-band filter includes an incident angle adjusting mechanism for adjusting the narrow-band filter so that the incident angle of the laser light incident on the narrow-band filter approaches 90 degrees with increasing ambient temperature.

24. An optical fiber amplifier comprising:
25 a semiconductor laser device including an optical fiber having an optical fiber grating, a semiconductor laser having an active layer with a single quantum well, for emitting pumping light, and a coupling optical system for coupling the pumping light emitted out of the semiconductor laser into the optical
30 fiber;

a pumping light-signal light coupling means for coupling the pumping light emitted out of the semiconductor laser device to signal light; and

5 a rare-earth-doped optical fiber that is pumped by the pumping light so as to amplify the signal light output from the pumping light-signal light coupling means.

25. An optical fiber amplifier comprising:

10 a semiconductor laser device including an optical fiber having an optical fiber grating, a semiconductor laser having an active layer with two or more quantum wells formed at intervals that are close enough to provide quantum coupling, for emitting pumping light, and a coupling optical system for coupling the pumping light emitted out of the semiconductor
15 laser into the optical fiber;

a pumping light-signal light coupling means for coupling the pumping light emitted out of the semiconductor laser device to signal light; and

20 a rare-earth-doped optical fiber that is pumped by the pumping light so as to amplify the signal light output from the pumping light-signal light coupling means.

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